SUPPLEMENT.

The Mining Journal,

RAILWAY AND COMMERCIAL GAZETTE:

FORMING A COMPLETE RECORD OF THE PROCEEDINGS OF ALL PUBLIC COMPANIES.

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OINT MEETINGS OF ENGINEERS AND SHIP-BUILDERS AT GLASGOW.

THE ECONOMICAL ADVANTAGES OF MECHANICAL VENTILATION.

Mr. D. P. Morison read a paper on the above subject, which he strated by a series of diagrams hung upon the wall. In the course his remarks, he stated that in the infancy of mine engineering, le the extent of coal worked from each output was still small, the ans adopted for replacing the vitiated air of a mine were primi- in the most literal sense of the word. A fire-lamp hung at the of a bratticed shaft was considered by many to be sufficient, but he area of the works were extended, and the number of men em- ed at one time increased, the air naturally became more vitiated, g to the products of respiration of the men and horses, the combustion of lamps, &c., and, above all, the generation of that scourge of many coal dis- s—the fire-damp, or the light carburetted hydrogen gas; and the aid of nce was called in both to increase the amount of air circulating through workings, and to avoid, by means of the safety-lamp, the communication of flame of the workman's light to the surrounding inflammable atmosphere. ing referred to the results obtained by furnace ventilation, Mr. Morison eeded to speak of the results obtained by the different systems of mechanical ilation. On this latter part of the subject he said those systems varied much nstruction and principle, as well as in duty performed. Ventilation might parated into two classes—those of varying capacities and of centrifugal n. In the former were included all piston or pump ventilators, as well as other more complicated inventions. In the latter were found the centri- l ventilators or fans of Combes, Letoret, Rammell, Waddle, Guibal, &c. reader then explained the operations of a number of the apparatus for ing ventilation, which he had referred to. In adverting to Lemielle's ition, he said of all systems of variable capacity, that was the one that ap- d so far to have produced the best results; but the heavy strain upon the rous machinery required to set in motion the eccentric shaft, the severe and tear, as well as great loss of power in overcoming the re-entries of air, very serious drawbacks to the economical working of the system. Guibal's e ventilator which, both on the Continent and this country, was becoming universal adoption. They were capable of producing volumes of air of ,000 to 200,000 cubic feet per minute, under depressions of from ½ inch to s of water-gauge. A Guibal ventilator, 30 feet in diameter, was compared Waddle of the same dimensions, under the same conditions, at Pelton y, Durham, and the result was found to be greatly in favour of the former . Both ventilators had the same work to do.

e President said they should feel obliged to Mr. Morison for g their attention in such a compact and interesting paper to portant a subject. The experiments quoted seemed to be simple short in detail on paper, but he could assure them that they took at deal of working out.

r. Lupton quite agreed with the remarks of the Chairman as to alue and excellence of Mr. Morison's paper. He was a great cate for shallow pits. He did not feel so confident that in deep ries fans would be so invariably used, because at a depth ex- ing 500 yards it would be found that the efficiency of the furnace equal nearly to that of the fan—at any rate that, considering reat depth, it would be found necessary to make large fans, and xpense would hardly repay the interest on capital. One thing, ver, could be said in favour of the fan—that was, that it re- d a smaller shaft to produce the same amount of work. If they o heat the air to a considerable temperature, and increase the of the air going up the shaft, and if to that extent they increased liameter, he thought it would be found that it was attended with derable expense, which ought to be taken into account in esti- g the cost of furnace ventilation. In many cases it would up the total cost of the furnace to that of the fan. Whilst he dered that in pits under 500 or 600 yards in depth the fan had vantage over the furnace, he was not prepared to admit that uibal fan was the best. It had been the best designed, and st worked hitherto, but it did not follow that it was designed rect principles. He was reading only the other day in *Engineering* count of some experiments made by the late Mr. J. J. Atkinson, hos. Evans, and other well-known gentlemen in the Midland ties on a modern fan, erected, he thought, at High Park or Moor Colliery, and there in one of the experiments the proportion licated horse-power utilised was 61 per cent., while the average umber of experiments was 53 per cent. It appeared from those iments that the effective horse-power alleged increased consider- with the speed at which the fan was driven, that whereas at a peed of (say) 30 revolutions per minute the percentage of horse- r utilised was only about 2·3 of the percentage utilised at the st speed of (say) 80 revolutions. He thought it would likely nd that, considering the shape of the Rammell ventilator and f the Guibal, the latter would be well suited as a low-speed, e former as a high-speed fan.

Steavenson (Durham) stated that the question of the venti- of mines by mechanical means was one which had during the n years occupied not only the attention of the district in which ed, but of himself in particular. There were not many of the e saw exhibited on the walls of the room that he had not in- d and tested thoroughly, and he could confirm the results given . Morison. The Guibal excelled all other kinds of fan. He r a long time in favour of the Lemielle, because it was, in fact, a rotary pump, and if it could be made perfect and light he saw son why it should not work as well as the ordinary lifting- . With respect to the fan at High Park Colliery, he had him- sted the engine and measured the air carefully, and he only per cent. Mr. Atkinson, who was there only a week or two e, entirely confirmed that result. The experiments referred to een wrong in the measurement of the air. The passage itself rge, and while at one part they found the speed of air almost ent to blow a hat off, in the centre of the passage the air was ly returning in a swirl. So that, unless the passage was evenly l there was room for an immense number of mistakes. With to the general question of mechanical as compared with fur- entilation, one or two remarks he had jotted down might as- few who had gone into the matter. He would assume the the Cleveland Mines, where 40,000 ft. of air were got under water-gauge. The horse-power amounted to 3·1 of the air. rse, the seam was thick and favourable for ventilation. That was obtained with a consumption of 93 lbs. of coal per horse- per hour. Where they had a thinner seam and a heavier drag me more serious. Now, if they took 1000 cubic feet at 1 inch gauge it equalled 0·16 horse-power; 10,000 equalled 1·60 horse- 20,000 equalled 3·20; 30,000 equalled 4·80; 40,000 equalled 0,000 equalled 8·00; and if they went to 100,000 ft.—and he think the water-gauge would exceed 1 inch—they had only e power. To obtain this result they would have to consume an immense amount of coal. With respect to first cost, he did not think there was so much in it, because they could not put a good furnace up under 1000*l.*, and they could fit up a fan like this for 800*l.* The saving in coal was enormous.

Mr. W. Cochrane said that Mr. Lupton had referred to the Guibal ventilator, showing at the slow speed a less percentage than at the high speed. He thought that the Guibal would be a good machine at either low speed or high speed, and that the Rammell would be the contrary. There was no difficulty at all in understanding why there should be less speed. They really put less work through, and they had all the friction of a fan to overcome. He thought they would find that this would apply to other centrifugal fans as well as to the Guibal. Mr. Lupton made another remark on this question. He thought that at 60 revolutions the volume of air was double that at 40. That showed them how inaccurately any experiments must have been made. Under the same conditions of motion the volume of air per revolution ought not to be increased at all. It ought to be the same volume. He thought, perhaps, as Mr. Steavenson referred to the checking of experiments which Mr. Lupton mentioned as having been made at High Park Colliery, the first set of experiments were entirely wrong, inasmuch as the total volume of air he had got in the underground gusts added up to 30 per cent. more than what he got in the main; therefore, altogether I think Mr. Steavenson will be able to say that these experiments must have been made very carelessly, and the mistake, no doubt, arose in the measurement of the volume of air. As a matter of theoretical principle, I should be extremely astonished if it was ever proved that any centrifugal fan, with an open discharge all the way round, ever reached 50 per cent. of useful effect: 47 per cent. was its theoretical perfection, but they had not arrived at that condition of things yet. It was only when they abandoned the discharge of air all round the circumference, and encased it like the Guibal, that they could accomplish 47 per cent. of useful effect. The casing of the fan was the real particular merit of the Guibal invention. Before that it had been considered necessary to have a free discharge, and the sooner they got rid of the air the better for the existing fan. It was, however, found that this was an entire mistake. The fan being entirely cased round gave rise to difficulties, in consequence of the velocity caused by the air being so much increased at its discharge beyond what was indicated, and which was really a check to the guages made by encasing the ventilator. This was one of the important elements of the ventilator, by which the varying conditions of mines, in the volume of the low water guage, or a small volume, could be repeated. Then there was the Vasey chimney. He only wished that Prof. Rankine had been present to have explained the action of the chimney, to which was due 25 to 30 per cent. of useful effect in that ventilator. If Mr. Lupton could go back five or six years in the volumes of the Mining Institute, he would find that Mr. Atkinson clearly proved that it required 346 fms. in depth before the furnace under ordinary conditions could equal the common class of ventilating fan, in utilising 60 per cent. under average conditions.

Mr. Lupton said, with regard to the relative efficiency of a fan for ventilation, it was obvious that that depended entirely on the sort of engine used. If they got a marine engine, consuming 2 lbs. of fuel per hour per horse-power, it would give the preference, for at most collieries the consumption was from 10 to 15 lbs. of fuel per effective horse-power. In a rough calculation he had made, where he arrived at an approximate depth of 500 yards, and where the furnace ventilation would be equal to mechanical, he indicated 10 lbs. of fuel per indicated horse-power as the quantity required. With regard to the experiments at High Park Colliery, he felt some difficulty in mentioning the subject. Everybody knew the great respect with which the late Mr. J. J. Atkinson was regarded, and the great authority which attached to all his experiments. But he felt surprised at finding him quoted on the one hand to knock him (the speaker) down, and when he (Mr. Lupton) got them to see that Mr. Atkinson's experiments were valueless to hear him quoted against the Guibal ventilator, because there was an error of 30 per cent. Experiments had been made by mining engineers, who had given a great deal of attention to this subject, and who were thoroughly conversant with the method of measuring the air, having done so all their lives; therefore, he felt surprised that when those two parties of enquiry both arrived at the same result, after most careful and detailed experiments, a gentleman from the North of England should find out that they had made an error of 30 per cent. in the amount of air. It was just as likely that the error was one way as the other. With regard to the percentage of useful horse-power realised, he had given 49 per cent., whereas Mr. Cochrane said that the utmost power that could possibly be given by such a fan was 47 per cent. Thus, they had already increased by 2 per cent. He could well understand that the Guibal would require casing round, considering the largely increased area of the circumference, as compared with the intake. The fan must be cased round, or it would simply be knocking the air about. Fans were so constructed that the velocity of the air in travelling through the fan should be the same; therefore, the necessity of contracting the opening was done away with.

Mr. Andrew Barclay (Kilmarnock), replying to the statement that the quantity of air was equal to the number of revolutions, pointed out that the quantity of air would be in exact proportion, not to the diameter of the fan, but to the square of the number of revolutions.

Mr. Dunn should like to ask Mr. Morison if, in the making of his experiments, he had taken the indicated quantity of air, or did he make any calculation of the working of the engine, and at what temperature were the experiments made?—Mr. Simpson replied that he had three Guibalt ventilator fans at work—one at 16, one at 20, and the other at 36 ft. diameter. He should confine his remarks to the one 16 ft. in diameter, which was suitable to the wants of the Glasgow coal field. This fan was driven by an 8-in. cylinder. They got 36,000 cubic feet of air in the pit with a water-gauge of ¾ in., and this was done with very little expenditure of steam. A small pipe 2 in. in diameter came from the boiler to supply this fan with steam, and they found no extra consumption of coal induced—in fact, the waste steam supplied it. They required no extra man to attend it; therefore, so far as shallow ventilation was concerned, the fan was effective. The depth of the pit was 44 fms., and for the information of some gentlemen who might think of putting up a ventilator he might state that its cost, including patent right and brickwork, at 25*s.* per thousand, was 420*l.* That ventilators had been in use for five years, it had worked most satisfactorily, and was never out of order. With respect to the other sizes, they were giving results of an equally satisfactory kind.

Mr. St. John V. Day, referring to the statement that the quantity of air discharged was in proportion to the number of revolutions, said he thought the air of the orifice of the discharge had not been noticed. He should like Mr. Cochrane to say whether that was the case with all the areas, because some engineers with whom he had been associated had made some experiments upon fans for the purpose of ascertaining their power of resistance to the different areas discharged, and they found that by reducing that the resistance of the fans was not increased at all, so that by-and bye, when the gate was closed, there was no air at all drawing into the fan. He should like to know if Mr. Cockrane could tell them whether or no the statements that had been made with regard to the quantity discharged varied considerably, or practically to any extent?

Mr. Barclay: In my reference I found very little difference in the pressure, whether the orifice was closed or not, but as soon as the orifice was closed the engine ran away as if it had nothing on it.

Mr. Harvey, referring to the formation of fans, stated that a friend of his had made a fan with seven blades, rather fragile in its form. It drove seven smiths' fires, and they resolved to make an examination of it, not that there was anything felt to be wrong, but they found every blade gone but one. They had fallen into the centrifugal space round about the fan. It seemed to be a question how far this diminution could go, and what quantity of blades could be put into a fan to produce the best effect, either for throwing air into fires for smiths' purposes, or for drawing bad air out of mines.

Mr. Barclay said he had found that a hollow blade had taken more air than a flat blade.

Mr. Marley: Mr. Lupton has set forth as one of the advantages of the fan ventilator that you can increase the size of the shaft. There is no doubt among mining and mechanical engineers that the fan is preferable to the furnace ventilator in every case. One of the great advantages of the fan ventilator is that we are getting nearer to that axiom that every upcast shaft should be used for no other purpose than ventilation. If we come to the question of comparing the size of the shafts in fan and furnace ventilators, the furnace ventilator advocates will tell you that these shafts can be used for coal drawing. That is a thing we are getting rid of. If Mr. Lupton takes into consideration that one reason why fan ventilation is getting the upperhand—namely, that you require more air if you decrease the size of the shaft—he will find that there will be no advantage. I would like to enter my protest against any decrease of shaft, or anything that will compel shafts to be used for coal drawing as well as ventilation. It should be an axiom of mining engineers to have, as far as possible, a separate shaft for ventilation.

Mr. Morison mentioned, with reference to the experiments he had quoted, that the air had been in most cases measured by tested anemometers. The great advantage of the mechanical ventilation was that it enabled them to utilise so effectively the upcast shaft for coal drawing by means of an apparatus at the top of the pit, and the advantage was very great, not only in the wear and tear of material, but also in the case of the lining of the shaft. They all knew the danger and expense of shaft lining in a furnace-pit.

The Chairman: You mean that the objection can be overcome?

Mr. Morison: Quite easily, by an apparatus called a cap-head at the top of the shaft.

The Chairman: If we went on until to-morrow we should get each gentleman to express something new or interesting regarding the useful, inexpensive, and improved condition of things; but I am sorry to say I must bring these remarks to a close. In instituting any comparison between these ventilators, you should have your particular attention called to several of the more important points—the depth of your shaft, the size of the engine, the extent of your escape into the chimney, the proportion of the size of the chimney, and the wear and tear. We have no means of knowing as yet the amount of oxidation of the material of which it is composed in the vitiated state of the atmosphere which must pass through the fan. The first cost of fans is a serious question; but if a gentleman walked into his fan and found one of his arms wanting he would realise a very serious difference of cost.

A vote of thanks was then passed to the reader of the paper.

ON J. GRAFTON JONES'S COAL-GETTING MACHINE.

Mr. Arnold Lupton (Leeds) read the next paper, which dealt with the above subject. He said—

Although the use of gunpowder has been hitherto almost indispensable to the economical working of coal in a large proportion of our mines, yet it is also generally acknowledged that the explosion of gunpowder in the confined passages of a mine is attended with some danger to life, and considerable injury to the health of the miners, who have to breathe the sulphurous products of combustion, whilst the shattering action of an explosion on coal generally makes a much larger proportion of slack than is made by the use of wedges. To find an efficient substitute for explosions has long been the desire and object of many ingenious men. The application of the force-pump naturally suggested itself, and the impracticable idea of forcing a wedge into coal by means of a hydraulic ram was patented. The plan was impracticable—firstly, because it is almost impossible to force a wedge of sufficient size into so compact a mineral as coal; and, secondly, because it would be equally difficult to find a prop to resist the backward pressure of the ram. The system of wedging coal by first drilling a hole, and then inserting the inclined pieces of iron or steel, between which was afterwards driven a wedge by means of a sledge-hammer, has, the writer is informed, been occasionally used. To substitute, in this instance, the hydraulic ram for the sledge-hammer, and to find a prop for the ram, by means of tension bars connecting its cylinder to the inclined pieces of steel above mentioned, was the ingenious device of Mr. J. Grafton Jones, and a machine constructed on this principle was patented by him in June, 1867. At that time, and subsequently, he patented other forms of hydraulic apparatus for breaking down coal, in which the use of the wedge was dispensed with. It is not, however, the object of this paper to describe the history of these remarkable inventions, but to call attention to the latest form assumed by the machine patented in 1867. It is constructed entirely of the best hammered cast-steel, specially made for the purpose in Sheffield; the tension bars and ram cylinder are all in one piece, being cut and bored out of the solid bar of steel. The ram is worked not by the ordinary force-pump, but by a screw-pump, patented by Mr Grafton Jones. By this means the power of the machine is immensely increased, the only limit to the force that may be applied being the strength of the tension bars. The form or pressing blocks, which was first introduced by the writer, renders the use of split wedges or other similar devices unnecessary, because the requisite amount of expansion is obtained with one wedge. This is a point of great importance, because the labour and delay of introducing additional wedges to obtain the requisite expansion is considerable. The movement of the pressing blocks is parallel to the axis of the machine, so that the whole length, and not one corner merely, of the blocks is pressed against the coal. This powerful machine has succeeded in pushing coal out of the solid without any holing or natural breaks in the coal; and at Kiveton Park Colliery, in South Yorkshire, coal is at the present moment being worked on this system. At this colliery the coal is very hard: to apply the machine a hole is drilled about the middle of the seam, and exactly on the end, by the lateral movement of the pressing

blocks, the coal is split along the lines of clearage. Blocks of coal, 4 yards long, and 4 ft. wide, are got at one operation. The coal is about 5 ft. thick. Thus, about 8 tons are got by one application of the machine, so that with a bar it can be easily broken up and loaded. In the steam coal of South Wales it is a comparatively easy matter to push coal out of the solid, and Mr. Jones has got coal there with a machine of comparatively small power. A machine constructed by Mr. Chubb, not half as powerful as Mr. Jones's, is, I am informed, successfully working coal near Aberdare. The first experiments made by the writer of this paper were in breaking down coal that had been holed, in which no difficulty was experienced. For this work machines are made as small as 2 in. in diameter, weighing only 40 lbs., although with one of them a pressure of 200 tons can be put upon the mineral to be broken. The 2½-in. machine, weighing 59 lbs., will, perhaps, be found more generally useful, and it is sufficiently strong to break down any Derbyshire coal, which is of the toughest kind. The instrument is applied in a similar manner to the application of gunpowder. The drilling of the hole with an instrument designed by Mr. Jones and the writer is an easy matter, as the writer can vouch from considerable personal experience. A man accustomed to use the drilling apparatus can fix the standard in a few minutes, and the time required to drill the hole to the depth of 3 feet varies from 5 to 15 minutes, according to the diameter and the nature of the mineral. Soft coal is much easier to drill than hard, and it is much more easy to drill on the face than the end. The drilling apparatus is supplied with two hands, not because the work is heavy, but because it is more easy to turn the centres when two are working; but when the collier has no man or boy to help, a little practice will enable him, when working by himself, to make a 3½-in. hole with this apparatus, as he could drill a 2-in. hole with an ordinary jumper. The advantages which the writer claims for the use of the hydraulic wedge and the drilling apparatus are as follows:—1. The safety with which mines may be worked with them as substitutes for gunpowder.—2. The superior shape of coal that has been wedged to coal that has been blown, and the less amount of slack made.—3. The improvement in the health of the colliers that will ensue on the disuse of powder.—4. The saving in labour by using the hydraulic wedge, instead of the hammer-driven wedge.—5. The saving in labour and the diminution in the amount of slack made by using the hydraulic machine to push the coal out in the solid, in working those seams whose nature is such as to render it possible.

The PRESIDENT enquired whether there was much difference between the machine which had just been described, and the one patented by Mr. Beddow, of London?—Mr. LUPTON replied that the main difference consisted in another form of screw-pump, a different kind of valve, and an altered form of pressing-blocks. He had used machines corresponding exactly with Mr. Beddow's.

The PRESIDENT put another question as to the cost of Mr. Jones's machine?—Mr. LUPTON stated the price of the different sizes. The cost of a 3½-in. machine—the size that was used for 500 tons, and which could be applied by one man—was 39*l.*, including the royalty. This, however, was exclusive of the drilling apparatus, which cost, he believed, 7*l.* 10s.

Mr. LAWRENCE (Durham) asked whether, in experiments on soft coal, Mr. Lupton had not found the lips or blocks of the machine embedded themselves in the coal?—Mr. LUPTON said that in all his experiments with the pressing blocks he never could see that they sunk to any appreciable extent.

Mr. COCHRANE said the question had struck him whether this machine had ever been tried by Mr. Lupton on stone, because he could quite see the practicability of this being done, and were it so it would obviate one of the greatest drawbacks against which they had to contend—he referred to the enormous quantity of powder-smoke they met with in the Cleveland mines.—Mr. LUPTON said that he had never tried the machine on stone, but as it was designed to be tried where it was not safe to use gunpowder he thought it might be applied in that way.

Mr. C. J. HOMER (Staffordshire) referred to the effect of the machine on a thick bed of blackband ironstone with which he was acquainted. He had met Mr. J. Grafton Jones at Birmingham, a fortnight previously, and that gentleman had undertaken in some thick seams of coal that he (Mr. Homer) was working, from 8 ft. to 9 ft. thick, to make use of the coal-wedge free of cost, and just giving him (Mr. Homer) the option of taking it afterwards if he pleased. He asked Mr. Jones whether the machine would be applicable for the working of blackband ironstone, and he might tell them that the inventor was of opinion that the machine was not suitable for such a stone.

The PRESIDENT was of opinion that, notwithstanding the difficulty which Mr. Cochrane had put in the way of the machine in respect of solid stone-drift, they would have a large percentage in steam-boat firing by the powerful mechanical application of Mr. Jones's ingenious invention.

Mr. MARLEY thought that Mr. Cochrane's difficulty might not be altogether unremovable, for he might use powder in the first instance, to get over-head in his bores—which in some parts of Cleveland had been attempted—and then make use of Mr. Jones's apparatus as an auxiliary; but, of course, that was all subject to experiment. He would like to ascertain from Mr. Lupton how far he had found in practice whether it required, as in the case of the Davy lamp in a coal mine, a regular professional man to go from bore to bore to use the apparatus in question. It seemed, however simple it might appear, as if a common man would not readily acquire facility in working the apparatus, and that it would require a skilled man to go throughout the mine.—Mr. LUPTON stated that he experimented on this machine for the first time last year in Derbyshire, and, satisfied with the first experiment, they left the machine down the pit. Next morning they found that the colliers had so much appreciated what they had seen that, without any instructions, they broke the coal themselves with the machine.

Mr. SUEDDEN enquired about the difference of cost in raising a ton of coal by a common workman as compared with the cost by a machine?—Mr. LUPTON replied that he had not yet worked a colliery exclusively on one system. The improved machines he exhibited had only recently been introduced. The most of his experiments had been made with inferior machines, but in the long wall colliery working all the cost of wedging down by means of hammers, which amounted to over 6d. per ton, was saved. He had estimated—the result was not borne out by a balance-sheet—but he had estimated that with those machines the cost would not exceed 2d. per ton.

In answer to Mr. George Simpson, Mr. LUPTON stated that the pressure was generated by means of a force-pump. The water was carried along a small pipe inside the reservoir. When it ascended to the cylinder it came to a number of small cylinders, 2½ in. diameter, along which rams worked up and down. The only strain on the cylinder was the bursting of the water in the small cylinders. To take the pressure off the rams they opened a cock, and the water poured back again.

[*To be continued in next week's Mining Journal.*]

STEAM BOILERS.—It is proposed by Mr. W. H. ADCOCK, of Nottingham, to divide the interior water-space of boilers into cells or compartments, the cells being in most cases at right angles to the line of draught from the furnace. The effect is to prevent the current of connection within the water, and to prevent the heat of the fire diffusing itself equally within the water.

STEAM BOILER FURNACES.—The invention of Messrs. W. THORNLEY, Little Lever, S. SPENCER, Prestolee, Lancashire, and J. WRIGHT, Gresford, Denbighshire, consists in applying openings or slots formed in the dead plate of such furnaces for the admission of air on to the top of the fuel lying upon such descriptions of fire-bars for the better consumption of the fuel, and further in the application of a slot or opening through the bridge from the furnace or ash-pit to the back of the bridge, which slot or opening may extend the whole width of the bridge, and be from ¾ in. to 1 in. in width, according to the size of furnace and strength of draught in the flue, such slot or opening being set at an angle of from 25° to 50° from the horizon or line of fire-bars, and thus such slot or opening allows the heated air passing through it to mix with the products of combustion passing over the bridge in the direction of the draught, and does not impede the draught, as when a current of cold air is admitted through a hollow or slotted bridge at right angles to the draught.

FURNACES.—The invention of Mr. T. TAYLOR, Pilsworth, consists in placing at the end of the fire-bars in furnaces a box made of cast-iron or other material, the whole width of the furnace, or any suitable portion thereof, containing a door or lid at the side next the fire-door, and on the top of the box, and at the other end a bridge of fire-brick is placed, and the box is covered on the upper side with fire-brick, and at about 7 in. from the last-named bridge another bridge of fire-brick, as ordinarily constructed, is placed. Between the two bridges is a grate, through which the air passes to the furnace, the amount of which is regulated by a handle attached to the before-named door.

STREET TRAMWAYS.—The invention of Mr. J. LIVESEY, Victoria Chambers, consists, first, in the formation of a permanent way for street tramways, the sleepers of which are constructed of standards of wrought or cast iron secured to iron plates, arranged so that the various parts shall come between the divisions in the pavement without offering any obstruction, and for the fixing of two standards on one base-plate; second, in the use of a section of rail having a projecting piece to form the groove for the flange of the wheel to run, and with pieces projecting downwards, in order to give greater vertical strength, and form a dovetail section, which admits of being secured without external fastenings, and also for a flat-bottom rail, having one side broader than the other for the purpose of forming a groove.

California's richest gold mine yielded a profit last year of $340,000.

Original Correspondence.

THE JOINT MEETING OF NORTH OF ENGLAND MINING AND MECHANICAL ENGINEERS, AND ENGINEERS AND SHIPBUILDERS OF SCOTLAND.

SIR,—This meeting has, upon the whole, been very successful, and has afforded a great deal of pleasure and instruction to all who had the pleasure of attending it, although it was expected that a larger number of members of the southern body would have availed themselves of the opportunity of inspecting the wonders in machinery to be seen in Glasgow, and the fine geological sections, extensive coal and iron mines, and, lastly, the grand and beautiful Highland scenery. The number of papers to be read could not be all got through in the limited time allotted for this purpose at the meetings, but they will, no doubt, be forthcoming at future meetings of the societies, and those papers actually read and partly discussed were of a most interesting and useful nature.

The paper of Mr. Geikie appears to be an epitome of the geology of the district well worthy the most careful study. It seems from this very interesting sketch that the Scottish coal fields are well marked basins or troughs, separated by anticlinal ridges, and those ridges consist of rocks older than the carboniferous, or of rocks which belonged to its low subdivisions. After describing the various districts of Scotland, which he divides into three regions, he alludes to the origin of coal. The origin of thin coal measures wherever found always affords matter for speculation. Mr. Geikie appears to think that the Houston coal has been formed in low-lying mud flats by a tropical vegetation, consisting of tree ferns and their congeners. This agrees with the opinions of most geologists of the present day, and the vegetable origin of coal is now generally admitted, and it is also, as remarked by Mr. Geikie, clear that the coal seams generally result from a dense growth of plants and mosses on the spot, as is shown by the under-clays, which contain in great abundance the roots of these plants. The great majority of those seams have these under-clays in all coal fields; it is, indeed, very rare that a seam is found where the under-clay is absent, and seams are more regular, and extend uniformly over a larger area where the under-clay lies than where it is absent. Mr. Geikie says that in some cases the under-clay is absent, and here it is found "that the coal was apt to vary much in quality and thickness, getting split up with lines and layers of sandstone and shale. Many of the seams without under-clays might be due to the submergence and eventual entombment of rafts of vegetable matter." We are not aware that seams have been much noticed in other districts where the under-clays are absent; these instances are certainly comparatively rare, but in an able paper contributed to the Transactions of the Northern Mining Institute, Volume VIII., Mr. Hurst, in describing the most important coal seams in Northumberland, contends that those seams had been formed in the second mode pointed out by Mr. Geikie—by submergence of masses of wood or vegetable matter in low-lying lakes or estuaries. The "wants" described by the Scottish geologist are common enough in some parts of the Newcastle coal field, but are then called by the miners "nips;" few of the miners would imagine that these "nips," filled with clay, shale, &c., are the sites of old water-courses, yet the inference is quite natural. When these "nips" were first met with in a certain locality in Northumberland, some 30 years ago, the miners were much puzzled what to make of them; they naturally enough took them for (what they really are in one sense) troubles, but could not make them out, as they lay nearly vertical, whether they were upcasts or downcasts, and after trying upwards and downwards in vain were surprised to find the coal the regular thickness in a horizontal line from the disappearance of the seam. One remarkable feature of the Scotch fields Mr. Geikie shows to be the very frequent occurrence of dykes, &c., of igneous origin—volcanoes, indeed, appear to have been exceedingly numerous, and appear, also, to have been in a state of action at the very time when the coal beds were in course of formation. Assuming what is evident, that the majority of the coal beds are due to the growth of ferns, &c., for the growth of which tropical heat was necessary, how have these changes of climate occurred, as the same locality is now far removed from the conditions necessary for the production of such vegetation? Was the whole of the coal basins, at the time of the formation of those beds, subject to active volcanic action, and if so, has the circumstance any bearing on the question as to climate?

In the paper of Mr. Hurst he treats more particularly of the Low Main seam, and shows by plans and sections what are the general features of that very remarkable seam, over a very considerable area, in the vicinity of Seghill, Seaton Delaval, Backworth, &c., and Hartley, and he adopts, without any hesitation, the theory that this remarkable seam was formed by deposition—that is, by the deposit of carbonaceous matter by running streams in low-lying beds or estuaries; and certainly the appearance of the coal beds, intermixed with shale bands, shaded off to a point at one end, and gradually thickened, until feet, and even many fathoms, are reached at the opposite end, appear to favour this idea very much. It is also remarkable that there are in this seam many faults and dislocations, and in two cases basaltic dykes, but these faults do not extend to the upper seams and beds of the series. The nips we have alluded to are also numerous in the Low Main seam, but do not occur at all in the upper seams; but Mr. Hurst does not account for their occurrence by the action of running streams, but attributes them to, or accounts for them by, supposing that they were caused by "upheavals."

We have, however, in Mr. Hurst's paper, although very elaborate on every other point, no account of the underlying clay of this seam (if any), nor any account of the fossils therein contained, if some of your readers could supply this deficiency, it might go far to establish or upset the theory set up in the paper. M. E.

Newcastle, Aug. 22.

COLLIERY EXPLOSIONS, AND SAFETY-LAMPS.

SIR,—The loss of life from explosions continues to be most lamentable, and it would certainly be most unseemly to dogmatise on the matter, and assert roundly that all those lamentable occurrences might be avoided, yet at the same time we do not hesitate to assert that many of them would be prevented by the more liberal use of safety-lamps. We have found that in Wales and other places there was a great prejudice on the part of the men against the use of safety-lamps, on account of alleged deficient light, and on the part of the masters on the score of expense. Now, we hold that both these views are wrong. As to light, if a man cannot work with the Davy lamp he can work with the Clanny, and the sooner all miners learn to work with some safety-lamp the better, as its use is quite as necessary to the miner, if he wishes to preserve his life as a good rifle is to the soldier, who wishes to destroy life. And as to expense, the safety-lamp, after the first purchase, costs less than any other kind of light. One man will consume at least in working a shift, or turn, 1d. worth of ordinary candles, and a Davy lamp only costs for the same time ¾d., so that there is a considerable saving on this head, which very soon recoups the cost of the lamp.

The reports of the Inspectors show the number of accidents from explosions in various districts, from which the following is compiled:—

Separate Accidents from Explosions in 1869:—

	Separate accidents.	No. of men killed.	Tons of coals worked.	Tons for each life lost.
Northumberland, Cumberland, and South Durham	3	8	27,295,996	3,411,999
Other parts of England & Wales	28	244	66,070,293	270,779

It will be seen from this statement that although the coals worked in Northumberland, Cumberland, and South Durham are 27,295,996, and the coals in other parts of England and Wales are 66,070,293 tons, not quite three times the quantity in the former district, yet the proportion of deaths is as 1 is to 30. How is this enormous discrepancy to be accounted for? It certainly cannot be said that Durham produces less gas than the other districts; perhaps the ventilation generally is better, but we would not like to vouch for this, as great advances have been made of late in all quarters so far as ventilation is considered. We would be more inclined to attribute it mainly to the general use of safety-lamps in the northern districts in all fiery mines.

As remarked above, safety-lamps, if these explosions are to be prevented, must be used, and the greatest care possible taken, if shots *must* be fired; but if other means can be used to break down the coal, shots also ought to be dispensed with. But how is this to be brought about? The Inspectors, there is little doubt, will support the introduction of lamps, but they have under the present Act little power that they can exert in this direction, and it is a matter well worth discussion whether some radical improvement to effect this cannot be introduced into the new mining Act, which will, doubtless, be passed in the Legislature next session. M. E.

Newcastle, Aug. 22.

COAL SUPPLY, AND COLLIERY WASTE.

SIR,—So much has been said and written in reference to our coal *supply*, and so many elaborate statements and statistics have been volunteered with a view to arrive at some sort of estimate touching the probable period of its exhaustion, that the subject would seem to be worn threadbare; yet little or no allusion has been made to the enormous *waste* which, in almost every instance, may be noticed in our colliery operations;—as in the masses of material suffered to accumulate in the pit, frequently the spontaneous source of deplorable consequences; and in the consigning of much valuable mineral to the mound or waste heap. The importance of this matter induces me to send you the following particulars of Homfray's Patent Separator, which is doing such good service at the New British Iron Company's New Hawne Colliery, near Halesowen, Worcestershire:—

The MACHINERY OR APPARATUS FOR SEPARATING, without the application of water, is represented in longitudinal vertical section by Fig. 1, and in plan by Fig. 2, each letter indicating the same part in both figures:—

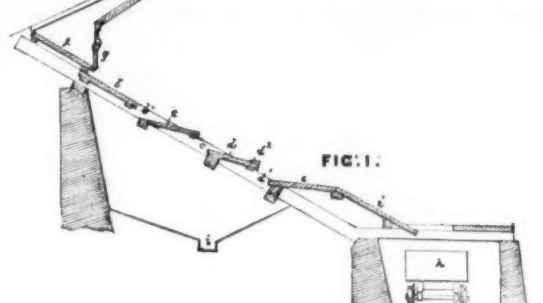


FIG. 1.

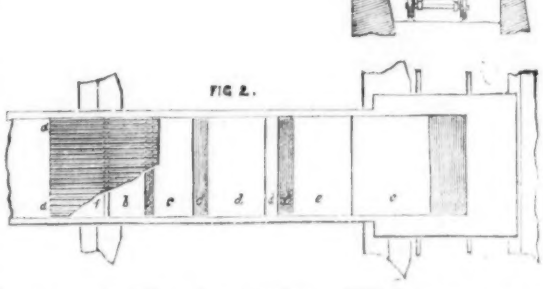


FIG 2.

It consists of an upper inclined screen or platform, *a*, and a series of lower platforms, *b*, *c*, *d*, of wood or iron, or wood covered with iron, separated by horizontal divisions or spaces, b^1, c^1, d^1, and forming a step-like figure; the spaces between the platforms being of sufficient width to permit the bats and other refuse to fall through them. Under the upper screen, *a*, is a hopper, *f*, provided with a door, *g*, the step or platform, *b*, has a greater inclination than the lower platforms. The coal from the pit (when the whole of the get is intended to be operated upon) is tipped on to the screen, *a*, the larger coal passing down it into a wagon or heap. The small coal passing through the screen, *a*, is received in the hopper, *f*, and retained by the door, *g*, on opening which the small coal and refuse, dropping a few inches, fall on the platform, *b*, from which the coal passes to the platform, *c*, and so on to the platforms, *d* and *e*, the momentum which the coal acquires causing it to jump the openings b^1, c^1, d^1; whereas the bat and dirt being denser, and moving with greater friction on the platforms, and consequently not acquiring sufficient momentum to jump the spaces, fall through at B^1, C^1, D^1. As the velocity of the coal increases as it progresses in descent, it becomes capable of clearing a wider aperture, hence each of the spaces, C^1, D^1, is wider than the one above it, so as to permit such larger and flat bats, &c., to fall through them as may be incapable of passing through at B^1. When it is necessary to further retard the bats, &c., V-shaped pieces of wood may be placed transversely on either or any of the platforms, as shown at D^2. The screened or separated coal passes down the platform *E* into the wagon *H*. The bats, slack, ironstone, or other impurities that fall through the openings B^1, C^1, D^1, are carried by water down an inclined channel and trough, *I* and *K*, Fig. 3, and further and effectually separated by the washing process. The platforms may be varied in number and inclination, and any one or more of them made to act as screens, to suit the nature of the materials operated upon.

The APPLIANCES FOR SEPARATING OR SCREENING BY WATER are represented in longitudinal vertical sections by Figs. 3 and 4:—

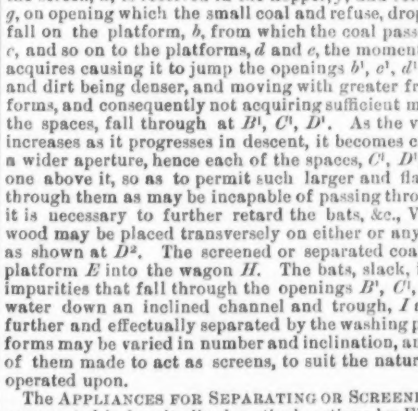


FIG. 3.

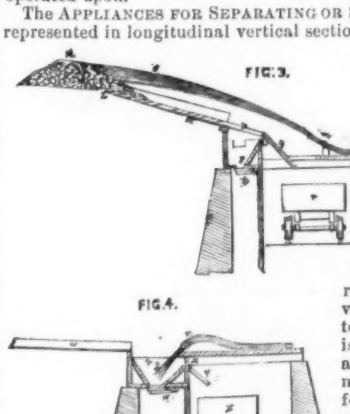


FIG. 4.

i, *k*, is a trough or channel down which the refuse from the screens of the separating apparatus, Figs. 1 and 2, passes to be further separated by water, which is either supplied from a suitable level above the trough or channel, or pumped with the required pressure, and conveyed by the flexible hose, *l*, to the nozzle or jet, *m*, and is delivered with considerable force upon the refuse matter, *n*. The mechanical force of the jet of water, *o*, combined with its solvent power, effects a very complete separation of the coal from adhering pieces of but or clay. The slack, bats, and water descending on the lower part, *k*, of the trough, are received on the screen, *p*, the larger bats passing over the said screen, *p*, down the incline, *q*, into the wagon, *r*, while the water and small pieces of coal and bats pass through the screen, *p*, into the box, *s*. The hose, *l*, and jet, *m*, are under the control of the attendant, who, by guiding the jet, *o*, can keep the screen, *p*, clear; the box, *s*, receiving the slack and small bats through the screen, *p*, has a trap or valve, *t*, at its bottom (or side); when the trap, *t*, is closed, the slack and water flow down the trough or sluice, *u*, Fig. 4, and fall into another box, *v*, with a trap, *w*, at its bottom side, or end; the traps, *t* and *w*, of the boxes, *s* and *v*, are opened from time to time, to let out any heavy particles that may have collected therein; the coal and water descending the channel or sluice, *u*, into the box, *v*, are in such a state of agitation that the coal is brought to the surface and passes over the side, *x*, Fig. 4, down the incline, *y*, into the wagon, *z*, it may, if necessary, be further passage from the box, *v*, to the wagon, *z*, it may, if necessary, be further screened, or washed, by similar arrangements. In front and on the top of the box, *v*, is another hydraulic hose and nozzle 2, by which a jet of water, 3, is delivered with considerable pressure, whereby

the agitation of the water and coal in the box, *v*, is augmented, and the contents of the said box, *v*, constantly stirred up.

Only such material as would otherwise go to the waste heap or remain below is, in this case, operated upon, and the amount of coal and slack saved is enormous. No accumulation goes on in the pits, as it pays well to raise all to the surface. As many as 240 tubs (14 cwts. each) of this waste alone has been operated upon at this colliery in one day, and that with a considerably less number of hands employed on the pit bank. GEO. RYLAND.

Birmingham.

GOVERNMENT MINE INSPECTOR FOR SOUTH DURHAM.

SIR,—In last week's Journal I observe a paragraph relating to the vacant Inspectorship, and Mr. Daglish's fitness for the appointment. Without at all questioning Mr. Daglish's qualifications for the office, I would ask, Is it at all fair to other candidates that his name should be repeatedly brought before the mining public in this way, without any apparent warrant? Surely there are other applicants quite as much fitted for the vacant appointment as he is, and who would be as much appreciated by both employers and workmen in the district as he would. Whoever may be the author of the paragraphs which have appeared from time to time, surely it must be characterised as an unfair way of setting one gentleman's name before the world in preference to the others. Let all pursue their candidature fairly, and do not let any one in particular be selected for public eulogy.

Fence Houses, Aug. 23. MINER.

THE GREAT WESTERN MARITIME SHIP CANAL.

SIR,—If the effect of constructing the proposed Great Western Maritime Ship Canal, to which reference has been made on several occasions in the *Mining Journal*, would be to make coals cheaper at the Cornish mines, the undertaking ought surely to have the support of every mine adventurer in the two counties, for in many mines a difference of a few shillings per ton in the price of coal would change the position from call-making to dividend-paying, and the difference of a few shillings per ton in the cost of carrying ore to Swansea (where a better price seems always to be paid than in Cornwall) would also be an important consideration. The item of coal is one of the largest which occurs in the merchants' bills, although it is one of the items about which the higgling that takes place whenever an order is given is excessive; and if the profit on buying coal be added to the commercial profit of working the canal those providing the capital would not be likely to complain. The net profit of 170,236*l.* upon an outlay of 3,500,000*l.*, which are the figures given by Mr. Owen, would give rather less than 5 per cent., but this, it is thought, would be largely increased by the indirect advantage derived by those using the canal.

Some slight injustice appears to have been done to Mr. Owen, by attributing the origination of the scheme to Mr. Telford, for it is universally acknowledged that Mr. Owen's scheme differs from Mr. Telford's both in route and dimensions, both of which are important considerations in connection with any canal project. It appears very doubtful whether Mr. Telford proposed a ship canal at all; and assuming that he did, it is quite clear that he did not in any degree detract from Mr. Owen's merits for originality. This could easily be proved by the publication of a map showing Mr. Telford's and Mr. Owen's routes respectively, and the gradients, &c., to be dealt with in the line of each. It is stated that Mr. Telford's scheme was merely to connect the upper portion of the Parret with the upper portion of the Exe, and thus secure water communication between the two channels. If this be so, there is really very little similarity between the two projects, and the origination of the maritime ship canal is entirely due to Mr. Owen, who proposes to connect the mouths of the two rivers by a ship canal of equal magnitude to the Suez Canal, and capable of being constructed, in his opinion, with no greater difficulty, and at even less cost.

Details concerning the undertaking will be read with much interest, and these must be given to ensure confidence that so large a tonnage as 4,261,334 tons in one direction could pass through annually, for it is observed that this tonnage would represent two-thirds of the coal trade of London and 25 miles round, and that to make it up there must be an average daily tonnage of nearly 13,615 tons. Of course, this is only the equivalent of 45 vessels of 300 tons each daily, but this is more than the average of the whole of the colliers that daily enter the Thames. The great advantage of the scheme would, no doubt, be the facility which it would afford for the carriage of coal in a more direct line to the Continent; but Mr. Owen must show that a rapid passage can be made, and must state the relative levels of the Bristol and English Channels, the force of the current available for keeping the canal clean, and the number of locks, &c., that will be necessary. As he has no doubt collected all these details, it is highly desirable that they should be published, in order to prevent the possibility of a doubt as to the practicability and commercial prospects of the enterprise.

The important saving in distance which would be effected by the use of the Great Western Maritime Ship Canal will readily be understood when it is stated that from Cardiff to Exmouth is now by the ordinary sea route 370 miles, whilst the proposed canal would shorten it to 80 miles, only three-fourths of which distance would be in the canal, and, therefore, as free from danger as the safest harbour. Whether the canal would greatly facilitate the introduction of considerably larger quantities of Welsh coal to the London market may be doubtful, but if the trade of the whole of Southern England and Northern France be secured to South Wales by the construction of the proposed canal the colliery proprietors, the consumers, and Mr. Owen will have good reason to congratulate themselves upon their success.—*Portsmouth.* K.

SCIENCE IN MINING.

SIR,—There are three elements that modern times have introduced into mining, which make that branch of industry not only of far greater interest than was aforetime attached to it, but that increase manyfold its profits. These seem to be:—

1.—A better knowledge of the variety of minerals to be met with, together with a more accurate chemical knowledge both of the nature and amount of their constituents.

2.—A great improvement in machinery, and with it a reduction in the cost it entails; together with the fact that this improved machinery for pumping and crushing, and a variety of other purposes, enables us so penetrate more fully into the heart of those coarse and poorer ores that were before thrown on one side, the cost of working them being too great to pay for so doing, but which, by reason of these improvements, are now utilised for the benefit of mankind.

3.—The great improvements of late in the art of metallurgy, that enable us now, with greater ease and less cost, to separate the noble metals from those of an inferior kind. This is specially the case with respect to the separation of silver from lead and copper ores. Thus we see that far more silver can be extracted now from galena (P.b.S.) than heretofore, and *much poorer* ores can also be dealt with, hence the value of these ores raised in proportion; much the same is also the case with the ores of copper.

It is "Science in Mining," then, that has raised the value of many many of those mines which for years past have been abandoned, and has enabled them to be worked at handsome profits, opening out new fields of discovery, and with that employment for hundreds of hands. We would desire to see this intelligence more universally tried and appreciated, and the ground we oft tread under foot, and throw on one side as valueless, fully examined and tried in the fire. Remarkable instances of these improvements in mining cross us from day to day, as may be seen in the valuable pages of the *Mining Journal*. Thus the Queen Mine, that has of late made such a name for itself by its discovery of silver ore, and was so well reported on by several authorities, one of whom was Capt. W. Hancock, who, by-the-bye, is so well qualified to give an opinion, being captain of the Old Treburgett Silver-Lead Mine, which is another instance of true science in mining.

The old Treburgett Mine combines every element of success, not only by improvements in metallurgy and machinery, but by having a scientific and energetic board, who know how to appreciate and work to the best profit its mineral wealth. This mine was worked some 30 years ago, and returned very good profits, when the lead ore alone was sold, without respect to the silver it contained; now improvements in metallurgy enable us to extract almost all the silver, in which the lead is said to be *very* rich, at a comparatively small cost. Again, the improvements in crushing machinery, together with those in chemistry and metallurgy, enable us to extract almost all the silver from the silver ore, which is in the form of *polytelite* exists to a very large extent in the capels of the lode of this extraordinary and valuable mine. Prof. Forbes has obtained over 3500 ounces of silver per ton, and from personal inspection should think a large extent of this valuable ore walls in the lodes on either side.

These are points not to be passed over in the "Science of Mining." *Polytelite* from Old Treburgett Mine, which was 30 years ago used for road making, wall mending and building, because the presence of silver was not detected, or if detected could not be extracted to profit, is now worth, from improvements in metallurgy, over 500*l.* per ton! No doubt but both this and the Queen Mine will, from the profits they bring, show in a practical sense the great importance of "Science in Mining." F. G. S.

TIN IN QUARTZ—TIN IN ELVAN.

SIR,—I have read with much interest the letter of Dr. Phipson on these subjects, inserted in the *Mining Journal* of Aug. 13. I have for some years directed considerable attention to the same investigation. I have, however, found tin in quartz greatly fouled with wolfram; this substance so nearly resembles tin in weight as to deceive some of even the most expert tin vanners when tried on the shovel, and the most practical mineralogists when trusting to the eye. I have known instances in which mine agents (and experienced men, too) promised and expected large returns of tin from stone to all appearances containing a large percentage of black tin, which even deceived them when stamped out, until put in the fire, when, to their chagrin and disappointment, the heavy tin-like mineral proved to be wolfram. There were the cases at the Great Bryn and Wheal Virtue, and other mines. In Kit Hill, also, wolfram has often disappointed the tinner. At Drake Walls it abounds, and has been utilised. Could this miners' enemy (?) be found in quantity a ready market exists for it, tunstic acid being in good request. I never remember to have found wolfram in elvan, though I have seen it in granite. It may be well observed in a granite and quartz vein at the back of St. Michael's Mount, Cornwall. I have never seen tin in elvan much fouled with iron of any variety, especially tungstate; indeed, all elvans are comparatively free from iron. Nearly all the elvan courses I have seen have a north and south direction, and at their junction with east and west quartzose veins invariably make rich deposits in the latter.

The vaieties of tin generally found in elvans that I have discovered have been locally termed toad-eye tin, shot tin, and wood tin; these occur in the same stone as the minutely disseminated oxide of the metal. These fanciful names have been adopted from a supposed resemblance to the subjects indicated; the tin being formed in nuccous masses, when split radiates like toad-eyes; if the stone be broken, so that the mass be not injured, it presents the appearance of rounded shot; when elongated pieces are divided it resembles the grain of wood. Examples of each variety may be seen at the School of Mines, Jermyn-street; some very rare and curious, from the Nancothan Mine, near Penzance, and from the Belovely Beacon, near St. Columb; these much resemble the wood tins found in tin streams. Tin in elvan is frequently very minute; the minerals with which it is then associated are said to hide the tin. Crystals of hornblende are very common, as in the case of the Terras Mine. Schorl (cockle of the miner), tourmaline, pyrites, and epidote are also found; hyperstone is also sometimes observed. It may be that one of the latter minerals is the crystal mentioned by Dr. Phipson.

I have examined some very rich specimens of tin in elvan. From the indications intimated by the analysis of the Terras stone, and from the mineral substances associated therewith, I should be inclined to consider the metal yielded would be of a very superior quality, resembling grain tin usually obtained from stream tin ore. I am surprised at the small quantity of iron contained in the Terras stone, which, if it gives 176 lbs. black tin to the ton of ore, and can be so easily raised and returned as is represented, cannot fail to be highly remunerative, if worked on an extensive scale: no low produce ever will pay to work in a limited and peddling manner, the cost of supervision, management, &c., bearing no proportion to the produce.

I should be obliged if the proprietors of the Terras Mines will forward me a small specimen of this elvan, and, if possible, a bit of stone, containing the crystal described by Dr. Phipson, and for this purpose I enclose my card. A MINERALOGIST.

TIN IN ELVAN—TERRAS MINE.

SIR,—Of late a great deal has been said and written on these subjects. Some of the controversalists have evidently been influenced by prejudice, some have argued in total ignorance of the matter, and others smarting under disappointment or hope deferred. From time immemorial, even unto the present, Prejudice against any but what senility would term orthodox principles of mining rules has been far too prevalent; it would be just as reasonable and scientific to argue that because tin has not generally been found and wrought in elvans of late years in sufficient quantities to be remunerative under the then imperfect systems of manipulation that it never will be, as it would be to adopt the antiquated maxim "Where 'tis, there 'tis," or the notion once held to be correct, that there was not a paying copper mine to be found east of Truro Bridge.

It is to be regretted that so many persons will be influenced by the *cacoethes scribendi* on matters their productions so readily show the authors' lack of experience in. The subject of tin dressing has been so greatly improved within the last 10 or 20 years, that ore which could not be returned at a profit before can now be made to yield highly satisfactory returns. Some of our largest and very best paying tin mines depend wholly on the vast quantities of low percentage ores, and the facilities with which such ores can be rendered marketable, and do not rely on chance bunches or "stones of rich tin" for their splendid returns. It would be easy to name two or three mines in point, situated in the Camborne, St. Agnes, or St. Just districts, neither of which produce ores of an average percentage superior to the tin elvan of the mine named at the head of this letter. In addition to this fact the Terras tinstone is raised almost at the surface, requiring the aid of no pumping or drawing engines; the ore is easily stamped, is far less fouled with wolfram or mundic (I see complaints are made under these heads by some one evidently ignorant of the quality of the ore), and is easily separated from the slimes, the elvan when comminuted by the stamps being of an arenaceous character, and not slimy or flookany. "What won't make tin will take tin," says an old tinner's apothegm. This saying is peculiarly and favourably applicable in this instance.

Now experience demonstrates that tin does exist in elvan, though no very great mines are at present wrought near the surface for tin—that is to say, in hard elvan quarries—evidences are not wanting that formerly tin was extensively worked for in elvan at the surface both in Devonshire and Cornwall; the extent of these works on the backs of lodes, and especially on caunter lodes, attest the fact, and account for the surprising "goffans," as the vast excavations are termed, so frequently met with. At the periods when these places were wrought the miners worked in private small companies, were content with the most primitive modes of procedure, had great facilities for water-power, every little rivulet capable of driving three or four heads was rendered available, and the tinners content with less profits.

"Shode stones" are more frequently found consisting of elvan and tin than any other variety, and one at all conversant with tin-streaming in a granite district cannot fail to have observed the great proportion of elvan pebbles with tin in them mixed in the debris; this may be well studied at Porkellis Moor. Surely, then, the Terras Tin Quarry should not be contemned because it is an elvan, or because it is at the surface.

To those who I consider are suffering under disappointment and hope deferred I would say—Fear not, your mine and quarry will shortly recoup you for all your outlay, the work is being done effectually; time must be expended in the erection of the proposed extensive machinery, and capital must be had to do it; you have an unlimited supply of the native material which "makes tin," and you have the man in your employ who is able to dress it, only give him *fair play*. Never heed what Prejudice, Envy, or Ignorance may advance: have faith for a short time to come, and you will all be rewarded as persevering adventurers should be is the opinion of a tinner of more than 45 years' experience. OLD MINER.

TERRAS TIN MINE.

SIR,—Having seen so many opinions *pro* and *con.* about this mine expressed in your valuable Journal of late, being a large shareholder, and finding that excursion trains were available, I visited Cornwall for a few days, and went to the Terras Mine *incog.*, so that no preparatory steps could be made by the captain or management to deceive me by slimes or tinstuff, or any of the thousand and one dodges we so frequently hear of. I guarded myself by taking with me copies of the prospectus, reports, &c., and called to my aid the assistance of a practical tin mining captain—one, by the way, who had been in nowise favourable in his opinions of the Terras or its district. We made a critical and close examination of the details of the description of the ground, the quarry, mine, &c., as well as of the machinery, tin dressed and in the course of being returned, and I am pleased to say the entire inspection satisfied my rather over fastidious attendant and gratified me.

So many conflicting opinions had I read and heard, that I confess (having been sorely bitten before) that I began to feel a little timid as to whether I and we were not being "Wadged." I am glad to say my fears are dispelled, and I have every confidence in the Terras Mine. I visited several other tin mines, in none of which did I see such outward, visible, and tangible sources of tin ore as at the Terras. I see clearly we have only to wait a little longer. I prefer my own inspection to that of any agent, and advise my fellow-adventurers to do as I have done. SHAREHOLDER.

Wakefield, Aug. 18.

MINING IN THE NORTH OF CORNWALL.

SIR,—After perusing your most valuable Journal for several months past, and seeing so many interesting statements relative to mining in the North of Cornwall, I was induced to take a tour through that part of the county; I will, therefore, thank you to allow me the space to insert the few remarks I make on the properties I visited.

In making my way to the north cliffs from Camelford, I crossed over the lead mining property called Fertrawanton, which I am informed is again taken up. This sett is a little north-east of the Old Treburgett Silver-Lead Mine, St. Teath. From the information I gathered from a miner who last worked in the mine, and from the specimens I saw, I consider this property to be worthy the attention of capitalists, being situated in the right formation for the production of galena. I found at Old Treburgett a powerful steam-engine, and the mine in course of being drained. Although I could not see any of the lode broken from unexplored ground, yet, from the information I gleaned, I think the company may look forward to good results, not only from new ground to be laid open, but from the remainder of the lode left standing from the last working, which yielded a high percentage for silver.

I then crossed the country, and visited the Old Tregardock Mine, now termed North Treburgett. This property is situated in the parish of St. Teath, on the north coast of Cornwall, and although I have not yet seen any remarks made on this property, yet I was surprised to see such fine heaps of lead broken from a lode on view, called the No. 2. The captain was on the ground, and very kindly took me through the workings; and, from what I could learn, this property has been in the hands of a company but a few months, and not many pounds have been expended in operations. An adit level has been taken up at high-water mark, and extended inland about 20 fathoms on the course of the lode. Throughout the whole drivage the lode is thickly impregnated with lead ore, and in several places will yield 8 cwts. of lead to the fathom. Judging from the appearance of the ground by the side of the lode, this quantity of lead will give a profit for taking away. The cliff at this point is about 250 feet in height; this will give good backs for stopes, should the lode continue to hold up good. I find also a shaft is sunk about 10 fathoms below the bottom of this level, at which point the men are engaged cutting into the lode, but there being as yet no machinery erected to keep away the water considerably impedes their progress. The agent informed me that he intended cross-cutting the lode at the bottom of shaft, and ascertain its value, before erecting any pumping machinery. I also saw that preparations were being made for dressing the lead on the floors and in course of breaking. I consider, from the appearance of the lode in the bottom of the level, as well as of the country the shaft is sunk through, in which spots of lead can be seen, that the lode cannot fail of being found equally as rich, if not greatly improved, when explored in the bottom of the shaft than in the level above. My attention was then drawn to a lode just ahead of the present adit end, called No. 3. From the longitudinal bearings of the Nos. 2 and 3 lodes, they will form a junction at no great distance beyond the present driving, at which point there is reason to expect a great improvement. Every attention should be paid to this lode, for, if I mistake not, it will not only form a junction with No. 2 in the adit level, but will also, according to its underlie, be intersected by the shaft at a deeper point. I consider this (No. 3) lode to be one of the leading veins of the district—that is, judging from its size and appearance in the cliff.

I was next conducted to the old workings on No. 1 lode, where I found men engaged in clearing the main adit level towards eastern shaft. I found that scores of fathoms of ground had been stoped away from the backs of this level, and many tons of lead had been sent to market. There is also an engine-shaft sunk below high-water mark about 40 fathoms, and different levels extended. The agent, not having seen this lode below the adit level, he very kindly handed me a report received from the late manager of the mine, judging from which there cannot be a doubt of this property becoming a lasting and profitable one if worked on a large scale, which I strongly recommend being done with the utmost vigour, when I am fully convinced that the company will be amply remunerated for the outlay, as the lodes are embedded in the right formation, accompanied by an elvan course, the nature of which cannot be surpassed for the production of galena, and which is generally considered by practical men to be a safe feature in mining, as where lodes are found to exist at or near such elvans they are seldom known to fail in turning out lucrative.

This property will tell for itself; and I consider it would be worth the time of capitalists to pay this district a visit, when I think they will agree with me that if more attention were paid to this part of the county it would speedily become the leading district in Cornwall for silver, lead, and blende. The Chiverton district never presented such cheering appearances, at such a shallow depth, as can now be seen at the North Treburgett Mine.

I next paid a visit to King Arthur's Castle, where I found operations had been commenced, and a good quantity of lead ore already broken. This evidently shows that all that is wanted to make this district a profitable one is to work the veins on a larger scale, and with economy, when I am certain that good would result.

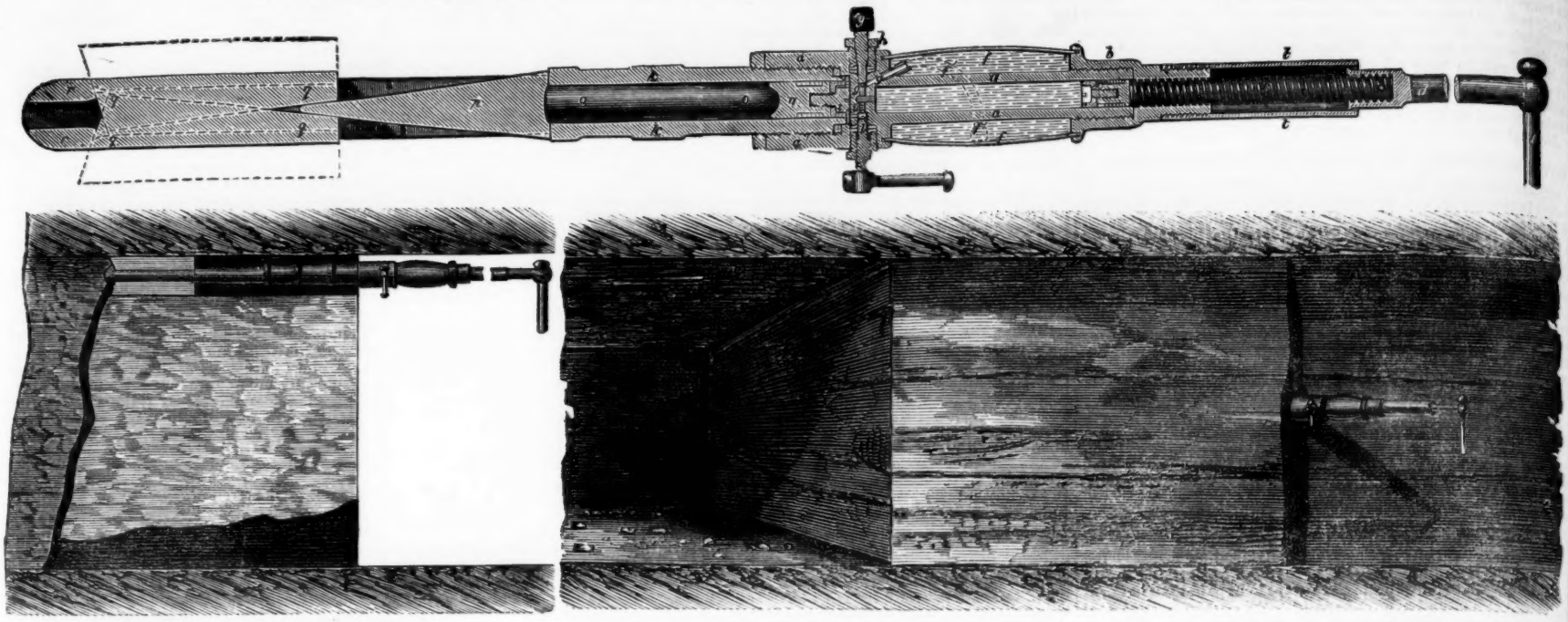
Callington. TOURIST.

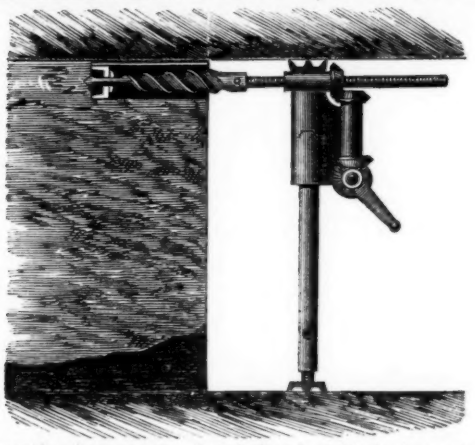
THE "CIRCULAR" SPECULATORS.

SIR,—The thanks of everyone connected with mining are due to you for your exposure in last week's Journal of the practices of Messrs. Wadge and Gibson. Allow me to relate my experience of the crafty efforts of the first and most able of the two operators to deprive me of some valuable mining shares. About seven or eight years ago I held a number of East Caradon shares, then very valuable. Wadge, having by some means ascertained this, wrote me an extremely clever letter, in which, after congratulating me on being his fellow-shareholder in so valuable a mine, he proposed that I should hand over my shares to him in exchange for double the number in a mine called West Ashburton, which he was then working, and which was revealing enormous mineral wealth. Luckily I had some time before read in the Journal a thorough exposure of Wadge's conduct in the case of the Erry Vane Mine, with its silver ore and amethyst spar; an exposure made, I believe, by your Truro Correspondent. Not wishing him even to see my handwriting, I did not reply. In about a week I received another letter, still more inviting and ingenious. Having taken no notice of this, I soon received a letter, couched in most insolent language, wanting to know why I neglected to reply to the communications of a "gentleman!" No doubt many of your readers could give their experience of Wadge and his associates. It is to be hoped they will do so, for the good effected would be great. In the Erry Vane affair he is said to have plundered the public of more than 1000*l.* By subsequent swindles, no doubt, he netted far more. Clergymen and ladies were, I believe, his chief victims. Such a clever rogue is sure to turn up again—probably under a different name. It is to be hoped, however, that swift exposure in the Journal will await him. [I enclose my name and address, though not for publication.] AN OLD ADVENTURER.

[For remainder of Original Correspondence see to-day's Journal.]

SUPERSEDING BLASTING IN COLLIERIES.





The continual recurrence of explosions in collieries has not unnaturally given rise to a desire to supersede the use of gunpowder in them altogether, but owing to the immense amount of labour saved by blasting, the workmen have been much indisposed to part with so powerful an ally. The desideratum was, therefore, a mechanical arrangement which should afford the workman an aid as powerful as gunpowder, and at the same time contained in a machine, compact and portable enough to permit of its being used as an ordinary tool. The wedge was the mechanical power considered by inventors generally to offer the best chances of success, the power of the ordinary hand-wedge, so largely employed in collieries previously to gunpowder obtaining such favour, being well known to the workmen, and the difficulty of giving motion to it by something better than the hammer being by no means great. That the first attempts to apply hydraulic power to the movement of the wedge should not have resulted in complete success was but reasonably to have been expected, yet from the working—at the Kiverton Park Collieries, near Sheffield—of the apparatus invented by Mr. J. Grafton Jones, of Blaina, it seems that the principal obstacles have now been surmounted, and that the banishment of gunpowder from collieries may now be fairly looked forward to.

The above diagrams will show the construction of the machine, and the mode of using it. It will be seen that the wedge and hydraulic press are formed in one piece, which is constructed of the best hammered cast-steel, and weighs complete only 40 lbs. In the above section, *p* is the wedge, and *q q* are the blocks of steel, between the inclined surfaces of which the wedge is driven, thus causing them to move outwards. The blocks, *q q*, are prevented from moving in the direction of the wedge by the bars, *r r*, which form an abutment for them, and which are made connected to, or in one piece with, the ram cylinder, *k k*. This arrangement, introduced by Mr. Jones, is the foundation of all the subsequent modifications of the hydraulic wedge. In the machine we are describing the water is forced into the cylinder, *k*, by the screw, *c*, which works in a cylinder of one-half the area. When the screw, *c*, reaches the end of its stroke a steel plug, *l*, is screwed down, preventing the return of the liquid. The screw, *c*, is then slacked back, and water rushes into the barrel, *a*, from the reservoir, *f*. Another screw plug is then turned, closing the entrance to this reservoir, and the plug, *l*, being unscrewed, the operation is repeated, three strokes of the screw ram driving the ram, *o*, to the full extent of its stroke. A partial vacuum is created in the reservoir, *f*; so that by unscrewing both the plug valves the ram, *o*, may be worked back, and the fluid used over again, the reservoir seldom requiring to be re-charged. The only limit to the pressure that may be applied with this instrument is the strength of the tension bars, *s s*, which are calculated to stand a strain of 50 tons, and as the wedge is inclined so as to multiply the pressure by four, a strain of 200 tons may be put upon the mineral. This can be applied by one man using the short lever at the end of the screw.

The delay which has occurred in bringing the machine into the market is explained by the fact that, although in its earlier forms its application was considered a great practical success, yet in the course of actual trials important improvements suggested themselves which permitted of the construction of equal power, though but one-fourth the weight. It is confidently asserted that the machine in its present form is thoroughly efficient, and that it can be used with great advantage in the headings and stalls of a coal mine, for, unlike gunpowder, its use is attended with no danger, nor does it shatter the coal by its action, whilst the saving in labour, as compared with the use of hammer-driven wedges, is very great. It can be applied to displacing coal which is holed either below or above, by simply drilling a hole near either the roof or floor, as the case may be, into which the wedge instrument is inserted. In many cases it will be found practicable to dispense with the costly and often wasteful operation of holing by using the more powerful machine constructed for forcing coal out of the solid. By the use of a light drilling-machine holes of the necessary diameter for the reception of the machine can be made in a few minutes with the greatest ease.

The Kiverton Park Colliery is in South Yorkshire, within ten minutes walk of the Kiverton Park Railway Station, on the Manchester, Sheffield, and Lincolnshire Railway, half way between Sheffield and Retford. Situated in an agricultural county, the coal measures have been pierced to a depth of 400 yards to reach the celebrated Top Hard coal of Nottinghamshire and Derbyshire, well known further north as the Barnsley Thick coal. The seam is here about 4 ft. 8 in. thick, and is nearly all a steam coal, well suited for steamships and blast-furnaces, for which its hard nature and freedom from sulphur well fit it. The ordinary way of working this coal is on the long wall system, the stalls being about 40 yards long. The coal is usually holed for a depth of 4 ft.; in doing this a great width has to be slotted down, and by this means about 25 per cent. of the coal in the seam is cut to slack; as this slack is valueless the average sale price of the entire produce of the seam is thus reduced by about 1s. per ton. This being the state of affairs, it occurred to the engineer and managing partner of the colliery, Mr. Thomas Carrington, jun., to try Mr. J. Grafton Jones's patent Hydraulic Wedge. After numerous trials and contentions with those difficulties which are too often met with, Mr. Jones undertook to work the coal with his machine at the ordinary contract price. Some idea of the success attending the operations may be gained from this fact that one collier, aided by two fillers, got out of the solid and filled 27 tubs of coal, 12 cwts. in each tub, or 16 tons, in one day of eight hours. It is expected that when a good staff of men has been secured the results will be unsurpassed. The stall in which Mr. Jones is working is not quite on the face, and is about 40 yards long. In commencing operations one end of the stall is cut in 5 or 6 ft.; in the corner thus made a hole is drilled on the end of the coal to a depth of 3 ft. 3¼ in. in diameter. The actual time in drilling the hole is 15 minutes on the average. Fixing the drilling apparatus takes from 5 to 10 minutes, but a little practice will enable a collier to fix the drill in a time not exceeding 5 minutes, as an inspection of the apparatus will make apparent to any practical man. The hole drilled and cleared, the wedge is then inserted; this operation only takes a minute or two. The collier now works the handle of the screw-pump, causing the wedge to move the pressing blocks in a lateral direction. At the bottom of the seam are a few inches of inferior coal; below this is a little bit of soft coal. With a pick the collier, by a few minutes' work, cuts a nick to a depth of about 1 ft. in the face, so as to loosen the coal in front. The action of the machine now up lifts the coal along the cleavage planes, and by the time about 2½ or 3 in. of expansion through the machine will give 3¼ in. has taken place the coal in front usually falls over; should it not fall at once an iron bar completes the work. In experiments during the week the length of one of the blocks of coal got in 25 minutes by one application of the machine was 7 yards, the average width 4 ft.; this block containing by measurement about 13 tons of coal; it is seldom that less than 5 or 6 tons is got at once. Each application of the machine leaves a buttock, at which it can be applied again.

As may be supposed, the system of working the coal by splitting it along the cleavage planes, so as to leave, after each fall of coal has been got, a buttock at which the machine can be applied as before, was only discovered after numerous trials; and it is found that a system very suitable for one seam is not always equally applicable when the hydraulic wedge is used in another. In the steam coal of South Wales, for instance, where the cleavage planes are not so distinct, the coal has to be broken along the numerous, but comparatively irregular, lines of fracture; but the system most suitable to the seam having been discovered, equally good results are obtained. The above remarks hold good when the hydraulic wedge is applied to breaking down coal that has been holed. A careful study of the nature of each seam has to be made, in order to ascertain the direction in which the expansive force of the wedge should be applied. A machine possessing ample power to get the coal may be so placed that it cannot work. A few days' trial shows whether the power should be applied vertically or laterally, and the depth that the machine should be inserted, according to the nature of the mineral, and the position and size of the block of coal to be broken down.

It is somewhat amusing to observe the rapid changes in the opinion of the colliers in regard to the machine; when, as it sometimes happens at a strange colliery, the machine fails, or succeeds with difficulty, on its first application, it is immediately condemned as useless; the second trial being made with some judgment, the coal is broken down; the men then express the most unbounded confidence in the power of the instrument, and unless checked, would set it to perform impossibilities. Mr. Jones has fixed the price of his instrument at a very low figure, in order that each colliery proprietor may test its efficiency for an outlay so small that it is thought that those who really desire to discontinue the use of powder can make no objection on the score of expense.

The highly satisfactory character of the results at the Kiverton Park Colliery has secured Mr. Jones orders for the wedges both from Durham and the Wigan district, so that it may be hoped that at no distant date the value of mechanical coal-breakers will be so fully established as to render the use of gunpowder in the presence of explosive gas altogether unnecessary.

New Ammonia Engine.—In the engine designed by M. Emile Lamm for employing ammonia vapour in lieu of steam, the liquified ammoniacal gas is contained in a reservoir traversed by tubes, and enclosed in, as it were, a bath filled with weak ammoniacal water. Into this the exhaust pipe leads the vapour, having done its work, being then re-absorbed and again giving out the heat which was rendered latent by the evaporation. No heat is lost except the mechanical equivalent of the power produced.

Boring Copper.—The invention of Messrs. W. Sumner and E. H. Waldenstrom, Manchester, consists in boring a hole through the ingot or casting for making the cylinder, roller, or tube, by means of a crown boring tool or annular drill, whereby the requisite hole is made and a solid bar of nearly the size of the interior of the drill is obtained, whereas in the ordinary mode of drilling or boring only cuttings or borings are produced; this bar, cut out by the annular drill, may afterwards be manufactured into cylinders, rollers, tubes, rods, wire, or other articles, or it may be used as an ingot for re-casting or making alloys.

Screw Wrenches.—Mr. J. Asbury, Balsall Heath, uses a fixed screw at the back edge of the bar of the wrench or spanner, and a screw box or wrench nut working thereon for actuating the movable jaw of the wrench or spanner. The fixed jaw of the wrench at the top of the bar projects beyond the back edge of the bar, and forms a bearing for the upper end of the fixed screw. The bottom end of the fixed screw is turned at right angles, and the said turned part is provided with a lip, which lip takes into a cross slot in the back edge of the bar. The screw is hereby prevented from rotating. The lip part described of the screw is fixed in its recess by means of a collar or band passed from the handle end of the bar, and made to cover the lip part and the junction of the screw with the bar.

METALLURGY OF LEAD.

The continued improvement in the lead market, coupled with the prosperous position of the mines of that metal in North Wales, will cause even more than usual interest to attach, at the present moment, to the exhaustive volume* just completed by Dr. Percy, of the Royal School of Mines. The original intention of including the metallurgy of silver and gold as well as that of lead has not been carried out, and it is explained that it was found impossible to embrace the whole in one volume of convenient size. As usual with Dr. Percy's works, the subject is treated exhaustively, and as all the diagrams given are drawn to scale, the practical lead smelter is enabled not only to determine which process is best calculated to meet his requirements, but to put the process selected into actual work. The physical and chemical properties of lead are first considered; then the extraction of silver from lead, and lead smelting; and, lastly, the preparation of lead compounds usually met with in the market.

With regard to the physical properties of lead, Dr. Percy tells us that it belongs to the class of white metals, but has a decided bluish grey tint. A freshly cut surface has a bright lustre, but it soon becomes dull from atmospheric oxidation. To the eye lead usually presents no sign of crystalline structure, though it is certain that the metal is an aggregation of crystals. Ihle observed very distinct octahedral crystals of lead in a cavity in a pig of lead from the Muldener Hütte, Freiberg; yet crystals sufficiently defined to admit of measurement by the goniometer have not been obtained. Lead is the softest metal in common use; it is very feebly elastic or sonorous, the dulness of sound being generally proportionate to the purity of the lead; and it does not cry, like tin, on being bent. Its specific gravity is about 11·38 when chiselled out of a very pure pig. Lead in a state of fine division may by mere pressure be made into a solid mass; thus, a paste of sulphate of lead and water is spread an inch thick upon a plate of zinc, and the whole is plunged into the upper part of a solution of common salt not quite saturated. After a few days the paste will be changed into a coherent soft mass of lead, which by immersion in hot water may be freed from the interposed solution of salt. Under a powerful press this mass becomes a solid plate of flexible lead, which stamped in a mould gives a sharp impression. If not strongly pressed the mass readily oxidises.

The chemical properties of lead are very fully treated of. The atomic weight, taking the average of the various authorities which Dr. Percy quotes, is 103·5. He describes the compounds of lead and oxygen, giving some very interesting particulars of the silicates of protoxide of lead; of lead and sulphur, recording a large number of carefully made experiments by Mr. J. C. Cloud, not previously published; of lead and carbon, mentioning the efforts that have from time to time been made to substitute the direct production of the carbonate of lead or white lead for the original Dutch process generally employed; of lead and arsenic, suggesting that nickel and cobalt should act like iron upon arseniuretted lead; of lead and phosphorus, remarking that experiments by Mr. Cloud confirm the statement of Berthier, that there is no reaction between phosphate and sulphide of lead at a high temperature; of lead and chlorine, stating that according to Berthier litharge partially decomposes chloride of sodium by the dry way, and melts easily with chloride of barium or calcium, pronucing yellow crystalline insoluble oxychloride, resembling Turner's Patent Yellow, from which water separates the excess of chloride of barium or calcium, mixed with baryta or lime respectively; of lead and nitrogen; and of lead and antimony, explaining that when lead alloyed with antimony is calcined (say) at a moderate red heat, with free access of atmospheric air, both metals are quickly oxydised, but the antimony in greater proportion than the lead, antimoniate of protoxide of lead being formed, so that by means of calcination lead may be practically freed from antimony, and accordingly such a process is adopted on the large scale in what is termed softening.

Referring to the alloys of lead, it is stated that the alkaline reaction of a freshly-cut surface of the alloyed lead prepared by Vauquelin by heating oxide of lead with cream of tartar is fallacious as an indication of the presence of potassium, since it is found that upon laying a piece of moistened red litmus paper on a freshly-cut surface of the purest as well as of common commercial lead, it becomes rapidly blue. Having referred to the alloys of lead and potassium, lead and sodium, lead and copper, and lead and manganese, he proceeds to describe the ores of lead, and inserts an admirable description, by Mr. Warington Smyth, of the mode of occurrence of British lead ores. The assay of lead ores is also treated of, the principles both of the dry and of the wet way being thoroughly explained. Alluding to the wet assay of lead ores, Dr. Percy remarks that several methods have been proposed for the estimation of lead by means of standard solutions, but he is not aware that any have been successfully applied in the assaying of ores of lead. They either fail in requiring too much expenditure of time, from inaccuracy of the method, from interference of substances often existing in lead ores, or from other causes. He believes that the dry method must always be resorted to as the only direct accurate and practical method of quantitatively estimating the silver in lead. Some of these methods have been tried in the Royal School of Mines Laboratory during several months, and have been abandoned on account of one or more of the objections specified.

The chapter on the extraction of silver from lead will be read with much interest, since it contains a complete account of the Pattinson process, and of the accidents which led to its discovery; and more especially so when it is remarked that Dr. Percy considered it desirable that there should be a permanent record from the pen of Mr. Pattinson himself, and, therefore, publishes a description which, with the exception of a few unimportant verbal alterations, is Mr. Pattinson's own, and which he prepared at his request for his use as lecturer on metallurgy at the Royal School of Mines. The same chapter also contains descriptions of Parkes' and other processes of desilverising; of the decopperisation of lead by zinc; of cupellation; and of the refining of blick-silber.

The student being thus provided with an ample amount of preliminary information, the subject of lead smelting is dealt with, historical notices of lead smelting in Great Britain, and some useful introductory observations on lead smelting, being followed by the description of the furnaces and processes used, and results obtained by the Flintshire, Spanish, Cornish, Bielberg, and other systems. Of the great value of Dr. Percy's work two opinions cannot exist, probably no one is better acquainted than he is with the literature of the subject, and it would be scarcely possible to utilise the knowledge which his extensive study has placed him in possession of, in a more satisfactory manner than he has utilised it in the present volume. It is really a cyclopedia of lead smelting, which may be referred to with the utmost confidence, and few will require more complete information than the book will furnish them with.

* "The Metallurgy of Lead, including Desilverisation and Cupellation." By John Percy, M.D., F.R.S. London: John Murray, Albemarle-street.

Compulsory Education—Foreign Mining.—An interesting pamphlet, explaining "How to check mendicity and promote compulsory education, without inflicting punishment," and treating of "Emigration to and Mining in British Guiana," has just been published by the well-known professor and translator, Dr. K. P. ter Reehorst, of 14, Percy-circus, W.C. The historical and geographical facts are given with the utmost care, and appeal most powerfully to the rich and the poor. Dr. Reehorst's object is to show how new companies may be started and capital invested upon a most solid basis, and how millions of the poor population may be usefully employed, their children educated, and poor rates abolished. The pamphlet is well worth reading, and as the price is but sixpence it is within the reach of all.

Roasting Pyrites.—The invention of Messrs. W. Helbig and R. Hasenclever, Holberg, Prussia, consists in roasting the ores at the surface of the angle which they form, if they are stored in heaps in the open air, and effecting the renewal of the surfaces and the passage of the ore through the said furnace, by taking away the ore at the bottom of the same, so as to cause a sliding movement of the ore in the furnace.

London General Omnibus Company.—The traffic receipts for the week ending August 21 was 10,512l. 5s. 2d.

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